



WORKING PAPER



Accelerating adaptation action in Africa

Insights from African adaptation experts

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Sedem Tetevi, a semi-pro basketball player, left his training to start an agribusiness in Keta, Ghana, to bolster community food security and women's and young people's employment in the midst of the Covid-19 pandemic. Read more about his business in Box 2 on page 8.

About this working paper

This CDKN working paper has been produced to help frame the conversations at the Africa anchoring event of the Climate Adaptation Summit on 25 January, 2021.

It is based on a series of interviews and commissioned blogs with leading African scientists and adaptation experts in October and November 2020.

These were supplemented with material by African presenters at the 'Race to Zero Dialogues' (November 2020) and UN Climate Dialogues (December 2020) and a rapid scan of recent literature from the continent by the CDKN team.

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For full affiliations of the interviewees, see References, page 29. To see the full texts of the commissioned blogs, please visit www.cdkn.org/africa-ambition

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Summary

Africa's climate is already changing: average land temperatures have increased by more than 1°C since pre-industrial times, sea levels are rising and extreme weather events, such as storms and droughts, are more frequent. Further climate change is inevitable. Adapting to its impacts is essential for African societies to develop sustainably.

CDKN interviewed leading African scientists and climate change adaptation practitioners, in late 2020, to identify the key actions African countries must take to rise to this challenge. CDKN also commissioned a series of articles by adaptation African experts on 'Accelerating adaptation action in Africa' and undertook a related literature scan. Statements from these leading scientists and practitioners are presented throughout the report.

This consultation highlighted three key areas of investment for unlocking effective, accelerated adaptation at scale in Africa:

- Investing in people's skills and knowledge.
- Investing in climate-resilient economies, which are well-informed by climate risk.
- Investing in nature.

For each of these three areas – people, climate-resilient economies, and nature – the paper provides detail on promising approaches to policy and programme design and investment that are already demonstrated in Africa. Specific entry points and opportunities are provided for each area, along with many grounded examples.

We flag technological and financial innovations with the potential to be rolled out at significantly greater scale (such as early humanitarian action and the use of insurance payments that are triggered on the basis of forecast impacts of extreme weather, to give but two examples).

The paper concludes that, as elsewhere around the globe, bringing adaptation to scale in Africa does not mean straightforward replication of adaptation solutions from one locality to another. Given the immense diversity in geo-physical, ecological, social and cultural settings across Africa, adaptation solutions must, naturally, be locally-appropriate and locally-owned if they are to succeed.

Working with indigenous knowledge is important. It capitalises on knowledge that people have developed to cope with existing climate variability. It helps build solutions that have legitimacy in local contexts. However, some indigenous knowledge techniques on their own will not be sufficient, where significant shifts in climate have already occurred, or will occur. Local wisdom must be integrated with scientific understanding of climate change, including scientific projections of future climate change, to inform development decisions with long time horizons of five or more years. Implementing more widespread and ambitious adaptation in Africa will require more such partnerships, to integrate these different forms of knowledge and advance understanding and action.

There is also an urgent need for more finance for adaptation overall, and for more climate finance to reach local actors, to support these local priorities and partnerships. At present, an estimated 10 percent of climate finance reaches local actors;¹ many African stakeholders are calling for this proportion to increase multi-fold.

However, a shift in more funding to local actors must occur in the context of strengthening public participation in climate and environmental decision-making at all levels (from local to national) and in the context of robust, accountable governance of public climate finance for Africa's communities.

Changes will be needed in capacities and institutional arrangements to support this shift. International development partners will need to change as much as African institutions themselves. Only with the combination of persistence, openness and adaptive ways of working by all partners can African countries be adequately supported to implement locally-appropriate, locally-led solutions.

Context

Introduction

Adapting to climate change is high on the political agenda for African governments. Adaptation features in all 48 of the national climate plans or Nationally Determined Contributions (NDCs) submitted by African governments to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015.²

The enhanced NDCs submitted by African governments in 2020 look to strengthen those adaptation actions. They also call on other countries to partner in mobilising the finance, technology transfer and capacity building needed to realise African ambitions in full.

At the same time, ambitious climate action and ecological restoration are key issues for a well-informed and vocal cohort of young Africans in their teens and twenties; and African businesses from the small-scale to the large are increasingly recognising and responding to short- and medium-term climate risks.

In other words, climate champions across African governments, business and civil society recognise that human-made climate change is well underway. Even if African countries themselves had little to do with causing climate change, they are taking action to deal with it.

There are already countless, small-scale and pilot initiatives underway across the continent to adapt to increasingly erratic, unpredictable and extreme weather events. There are also breath-takingly large and ambitious initiatives underway. Perhaps none is greater than the Great Green Wall Initiative, which involves 21 countries from Senegal to Djibouti. This African Union-backed effort to reverse serious land degradation and restore natural ecosystem functions will generate sustainable livelihoods and buffer communities against heatwaves, floods and rising temperatures.

The pressing question for public and policy debate is not whether to adapt to climate change. It is: How do we identify which approaches work, and accelerate and scale up effective adaptation to climate change? And, in parallel: How do we create ambitious international action to limit average global warming to 1.5°C?

This working paper is concerned with the first of these questions, which focuses on how to accelerate adaptation action. It is a contribution to framing discussions at the African anchoring event of the Climate Adaptation Summit held online worldwide on 25 January 2021 (www.cas21.com).

Guided by specially-commissioned articles and interviews with African experts, and supplemented with citations from recent literature, the paper sets out an optimistic picture. It provides a call to action for numerous measures targeting people's knowledge and skills, finance and the economy, and the natural environment – to set African countries on a pathway to a secure, climate-resilient future.

Africa's climate is already changing

African land temperatures have been rising higher than mean global surface temperatures. Much of Africa's land area has already warmed by more than 1°C since 1901.³ Rainfall changes are not homogenous across the continent. In southern Africa and west of the Atlas mountains in north Africa, rainfall is below average; other regions are seeing above-average rainfall.⁴ Sea-level rise reaches 5mm/year in several areas on the continent's coastline and in certain areas, exceeds 5mm/year. This is above the rate of average global sea-level rise of around 3-4mm/year.⁵

Over this century, increases in average temperatures are very likely across the continent. The duration of heatwaves and warm spells will increase. Reduced rainfall is likely in north Africa and the western part of southern Africa.⁶

These changes in the African climate will have profound impacts on physical, biological and human systems now and in the future. Africa is vulnerable because hundreds of millions of people rely directly on the natural resource base, specifically, on rain-fed agriculture and rain-dependent pastoralism, for their survival.⁷ "Climate change is the greatest threat to Africa's growth potential," warns Dr Fatima Denton, Director, Institute for Natural Resources in Africa, United Nations University (UNU).

Areas of Africa are well known as ‘vulnerability hotspots’.⁸ For instance, scientists in the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAS) programme found that under the highest global emissions scenario assessed, the African continent as a whole will experience a temperature rise of +1.5°C and +2°C by 2025 (2008-2043 period) and 2043 (2022-2058 period), respectively: “Yet arid and semi-arid countries will warm more rapidly than more humid countries,” they say. “These countries are more sensitive to heat-related impact. Countries that have continental climate conditions, with large interior regions away from the coast, such as Niger, Burkina Faso and northern Mali, will also experience greater temperature change.”⁹

“Climate change is causing a shift in the social fabric of Africa,” notes Dr Musonda Mumba, Head of the Terrestrial Ecosystems Unit for the United Nations Environment Programme. We see this, for example, in the Sahelian region, she says. “People migrate because food can no longer grow or their lake system is shrinking, food systems are changing, and they no longer have supply. It has an implication [for] the economic dynamic, because these countries are dependent on people for human capital, for labour. So with these changes, already we are going to see the ripple effect of the multi-layered impacts of climate change on society.”

Protecting nature provides a solution

Across diverse African environments, a larger trend is also discernible: the unsustainable management of the natural environment is weakening nature’s defences against climate change. Climate change has negative effects on ecosystems, but unsustainable use of natural resources damages ecosystems, too.¹⁰ The two interact and reinforce each other, doubly undermining human security. We can intervene to better study, value and protect the natural environment and its vast benefits to society.

Dr Jacqueline Uku, President of the Western Indian Ocean Marine Science Association (WIOMSA), observes: “When we have storms, higher temperatures, ocean acidification, these all present threats to biodiversity. But the biggest challenge Africa has is that we are yet to document all the species that we have. This poses a risk because we will lose biodiversity and we do not even know what we had in the first place: resources on African coasts that can be used for medicinal purposes, resources that can be used as alternative food products. It is important for us to invest in the tools that assist us to document the biodiversity, otherwise; we run the risk of losing a lot more than we ever knew.” The benefits of conserving and restoring nature are not only economic, social, cultural and spiritual. Conserving nature can also contribute to stabilising the regional and global climate – when, for example, carbon-rich ecosystems (such as mangroves and forests) are nurtured – and can help people adapt to climate change impacts.¹¹ Adaptation benefits range from restored watersheds that regulate water quality and flows (see pages 24–25), to agro-ecological diversity that protects against the decimation of mono-crops from climate-linked plant diseases.¹²

Africa’s capabilities – of and for the people of Africa

It is important to look at African capabilities to adapt to climate change. It is true that the continent’s diverse countries and communities face significant challenges in the face of climate variability and change. However, it would be misguided to spotlight only Africa’s climate vulnerabilities and needs for greater financial, technical and knowledge resources – at the risk of perpetuating perceptions of weakness and dependency.



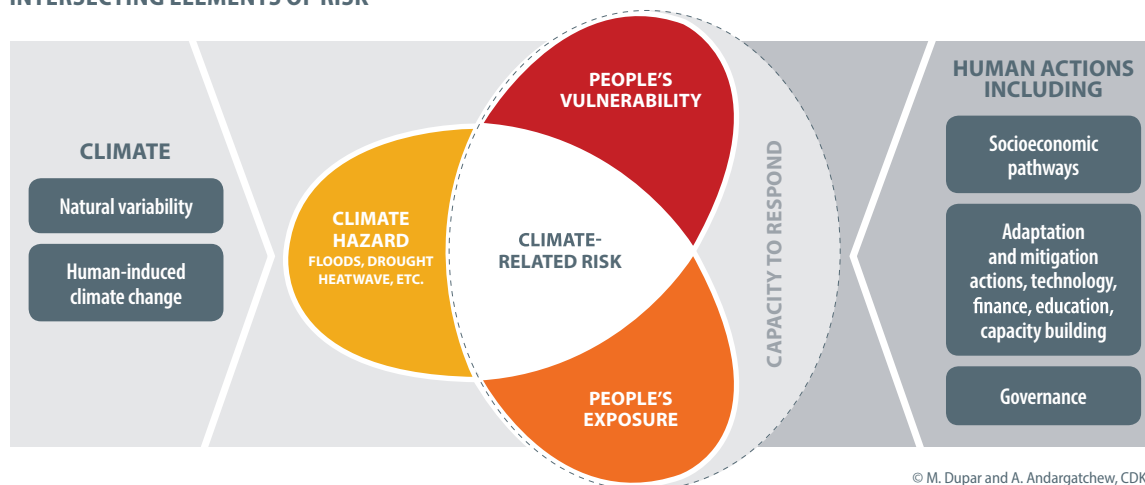
You do not need a scientist to tell an African who is over 40 years old that the climate is changing; they have seen it in their lifetime. In north Mali where I grew up, once there was snow on the mountains and now there is none.

Dr Youba Sokona, Vice-Chair, Intergovernmental Panel on Climate Change (IPCC)



Box 1: Defining adaptation and resilience

- **Adaptation** is “the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities.” (IPCC, 2014: 1758).
- **Resilience** is “the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation.” (IPCC, 2014: 1772).

Figure 1. 'Capacity to respond' should be at the centre of climate risk assessment and management**INTERSECTING ELEMENTS OF RISK**

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ODI and SouthSouthNorth, 2020;
adapted from IPCC (2014), Fifth Assessment Report.

It is time to change the narrative and recognise the widespread resolve among communities to adapt and thrive. A CDKN training programme (2020), devised for and with the Climate Resilience and Green Economy Unit of the Government of Ethiopia, reworked the IPCC's classic diagram (2014)¹³ showing climate risk as the intersection of hazards, exposure and vulnerability. This new version (see Figure 1) puts individuals' and institutions' capabilities right at the centre of the equation. Accompanying materials talk not only about people's intersecting vulnerabilities to climate change – the prejudices and ill fortunes that can hamper their responses to climate change (including poverty, gender, age, health conditions, etc) – but also people's multiple intersecting talents and potential for rising to the challenge.

Are we overlooking African ingenuity to deal with incremental changes?

The headlines are dominated by disaster events at the extreme end of the scale: events such as Cyclone Idai, which overwhelmed not only local capacities to cope but also supportive national systems to respond. There is no question that in the face of rapid-onset, high-intensity climate hazards, such as cyclones, there is a vast amount of work still to do on disaster preparedness and response (robust early warning systems, improved climate services, all of which are addressed, below).

However, does the incidence of large-scale disasters (the result of rapid-onset climate hazards) mask the extent to which countries and communities are already dealing with slow-onset climatic changes? The evidence points to Africans getting on with the job of coping with the creeping effects of climate variability and change in many diverse contexts and to a significant degree. They are learning as they go, and they are accruing greater local knowledge in so doing. This message comes through loud and clear from the consultations and literature review involved in preparing this paper.



Many communities in Africa are not waiting for a handout from government, there is some kind of hands-on approach in the way they are addressing adaptation problems.

Dr Fatima Denton, Director, Institute for Natural Resources in Africa, United Nations University (UNU)



This paper discusses how to accelerate the innovation and uptake of effective climate change adaptation solutions on the continent. It spotlights where African ingenuity is already rising to the challenges of slow-onset climate changes, such as prolonged droughts, more erratic rainfall and sea level rise, and impacts such as flooding, increased erosion and reduced crop productivity. At the same time, the paper also highlights where disaster risk reduction measures have been effective in saving lives and protecting assets from rapid-onset climate hazards, such as storms, and what further efforts are needed to expand these measures.

Invest in people's skills and knowledge

A climate-informed education system

Africa's demographics are strikingly youthful: one half of the continent's 1.3 trillion people is aged 0-19 years (United Nations 2020 estimate).¹⁵ Their generation will face even more erratic weather patterns and climate extremes over the course of this century, than those experienced today. Climate variability and change will have pervasive impacts across all sectors and walks of life. Whether today's young Africans are destined to find their future livelihoods in the natural resource-based economy, in the growing industrial or service sectors, or the knowledge economy, many of their future decisions will need to be grounded in an understanding of climate change.



We have learned that adaptation is not a one-off project, but a longer process requiring institutional and individual capacity building.

Funanani Muremi, Deputy Director, International Climate Change Department of Environmental Affairs, South Africa, and UNFCCC Adaptation Committee member.¹⁴



The African Union's *Agenda 2063: The Africa We Want* has as a key goal of "well-educated citizens and skills revolutions underpinned by science, technology and innovation" and, in tandem, the goal of "engaged and empowered youth and children."¹⁶ These are among 20 goals contributing to the *Agenda 2063* vision for an integrated, prosperous and peaceful Africa, driven by its own citizens, representing a dynamic force in the international arena.¹⁷

As African countries strive to achieve universal school enrolment and high quality education for girls and boys, there is an outstanding opportunity to teach children and young people about why climate change is happening and how to respond. Where better to enrich and extend the curriculum than with climate-related knowledge, to prepare young people to address what Dr Fatima Denton has called "the greatest single challenge to Africa's growth potential."

At higher education level, universities have vast untapped potential to accelerate climate-related curriculum development and roll-out. Emergent leadership exists, as in the Southern African Regional Universities' Alliance (SARUA) Climate Change Capacity Development Programme, which launched a regional collaboration among universities to develop climate change curricula.¹⁸ This includes the launch of a Master's curriculum in climate change and sustainable development in English, French and Portuguese in 2016 for open access and use by all universities of the Southern African Development Community. The potential for scaling up successful pilots such as this must be a priority for action and is easily achievable in the near term.



Climate compatible development requires... a new way of thinking about knowledge in universities and in society.

Mozambican participant in workshop to map SARUA's Climate Change Capacity Development Programme



A climate-smart workforce

A stated aspiration of *Agenda 2063* is the provision of 'decent work' for the continent's people. The context for providing decent work is complex and multi-faceted.

Decent jobs need to be created in the context of:

- the changing climate and its impacts; the integration of climate adaptation and mitigation solutions into governments' economic growth and industrial development policies and strategies;
- national and regional fulfilment of vast infrastructure needs (estimated by the World Bank at about \$100 billion a year in Africa, for the next decade);¹⁹

- the dominance of the informal sector as Africa's biggest employer,²⁰ which the International Labour Organisation estimates makes up 86 percent of all employment in the region;
- the importance of micro-, small- and medium-sized enterprises (MSMEs) in the region's private sector;
- widespread energy supply and access needs with vast potential to leapfrog into renewable energy; and
- the so-called global 'fourth industrial revolution'. The fourth industrial revolution is characterised by the increasing digitisation of the financial sector and supply chains, which increasingly penetrate the continent's commerce.

These contextual factors, together with the natural resource endowments and structural aspects of each country's and region's economy, create different opportunities for the creation of public and private sector jobs and upskilling the workforce (e.g. through vocational training for school graduates or more mature workers). Education opportunities and vocational/executive training that is climate-smart all need to fit these realities.

Actors across business and government (operating in the formal sector) and across civil society organisations and NGOs (more frequently supporting workers in the informal sector) have an opportunity to upskill different groups of workers with relevant climate knowledge to apply in their respective professions and livelihoods. We note there are particular opportunities to enhance the skills and knowledge of young entrepreneurs and of MSMEs on climate adaptation and climate risk management.

Here, we touch briefly on how young African entrepreneurs are capitalising on the pressures and opportunities afforded by multiple hazards (Covid-19, climate impacts) and digital technologies in the agriculture sector. Readers are encouraged to seek more information and opportunities for collaboration on the 'green jobs and just transitions' agenda via the International Labour Organisation's dedicated work in this area, which has significant African regional dimensions.²¹

Agenda 2063 emphasises the African continent's potential to develop added value in the agriculture sector, through improved processing and distribution and the growth of agribusiness.²² A significant and growing cohort of young African business leaders are seeking to develop successful agri-enterprises to generate sustained rural income in full recognition of the changing climate.²³ The Covid-19 pandemic and related economic disruption, with its heavy threat to food security, has stimulated further interest in climate-smart, digitally-connected rural enterprises (see Box 2).



Participants at a meeting of the Southern Africa Climate Finance Partnership. Photo credit: SouthSouthNorth



Young people develop a sustainable agribusiness in Tunisia. Photo credit: Marcel Crozet/ILO.

Box 2: Young entrepreneurs lead development of climate-smart agribusiness

Agriculture may have an image problem among some of the young people – who consider it ‘dirty work,’ according to Chantal Adiko, Director of AfriCompost, Benin. However, she asserts that agriculture can offer successful and profitable enterprises, and she is on a mission to demonstrate this potential. AfriCompost is an example of a domestic firm that supports young people and women to gain value from organic composting and producing home-grown wheat and tubers. Ms Adiko found that her agri-business was well positioned to capitalise from the slowdown in international trade during the Covid-19-related lockdown by promoting domestically-produced flour and other agricultural products, rather than imported ones.¹¹⁷

Hasna Zamouri, a young entrepreneur from Tunisia, works with local communities to produce honey: a part-time livelihood which requires little land and can be combined with other work. Young people face unemployment and have little or no savings, she asserts, but beekeeping requires little capital investment or land and enables young people to nurture a living from the natural environment while supporting the indigenous plants and animals of the area.

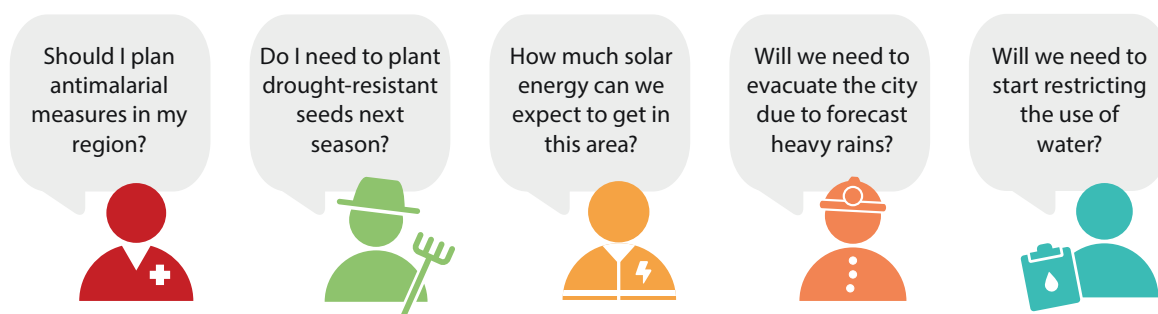
Both young women were highly adaptive when the Covid-19 pandemic hit, moving quickly to seek out digital platforms for marketing their products. They epitomise a young generation of African entrepreneurs who are ready to embrace digital technologies as a means to harness information to improve farming and agribusiness practice.

For Sedem Tetevi, the Covid-19 pandemic and resultant disruption to food supplies in his home village of Keta, Ghana paused his nascent basketball career and work as an engineer in the nation’s capital inspired him to return to the village to start an agribusiness. He and a friend co-founded SEDLA, a youth-driven commercial farming business, which aims to protect communities from starvation during the pandemic, and provide much-needed income. The business has involved young people and women in commercial farming, from production to processing and supply chain management, and is highly attuned to climate conditions in order to give predictable yields.

“The Covid-19 crisis has presented a chance for people to be proactive, creative, and innovative to tackle the numerous challenges it has posed, including food security,” reflected Misper Apawu, a Ghanaian reporter who captured Sedem’s story. “Initiatives by young people like Sedem to sustain his community during the pandemic and beyond shouldn’t be underestimated. Young people in this part of the world prefer to be employed rather than venture into entrepreneurship, not to mention agribusiness entrepreneurship. This initiative can be an example of how helpful agriculture is to rural communities. Different forms of support are vital for this initiative to be sustainable. They should be supported by experts’ advice, equipment, and marketing facilities. They need it.”

Figure 2. Climate services provide actionable information

Climate information helps individuals and organisations make climate-smart decisions



Adapted with permission from WMO, Global Framework for Climate Services (wmo.int, undated)

Robust, well-integrated climate services

More effective climate services are needed: first to assess, and then to fulfil the needs of diverse people and sectors for better knowledge of weather and climate and their projected impacts (see Figure 2).²⁴ The emphasis should be on ‘actionable information’, as Dr Owiti Zablon, a climate services specialist, insists.²⁵

National governments and donors have, in recent years, recognised the acute need to strengthen Africa’s climate services capacity. This has led to a multitude of donor-backed external investments, in partnership with national governments, non-governmental organisations, research institutes and others, to deliver services to diverse actors, from boardroom to farm gate. These programmes have, in many cases, involved complex partnerships and the generation of new data-sharing protocols and broadcast campaigns. A reduction in storm-related deaths and protection of livelihood assets and property can be attributed to many of these programmes, as they have tangibly improved the delivery of effective climate services. For example, an initiative to develop more accurate and timely weather forecasts and relay them to fishers on Lake Victoria – the High Impact Weather Lake System (HIGHWAY) project – is credited with saving lives and equipment from storms;²⁶ and an initiative to communicate more timely and accessible weather alerts to fishers in coastal Tanzania showed similar results.²⁷

However, African national and even regional climate services are still not fully mature and financially sustainable – including being bolstered sufficiently by donor funds or being adequately covered by national government budgets (or a blend thereof). A recent analysis suggests that grant-based donor support for climate services will be needed for a substantially longer period, in order to embed the elements of sustainable capacity they need: long-term business plans, comprehensive labour force skills, partnerships among organisations and protocols for responding to dynamic user needs over time.²⁸

This is not asking for a blank cheque to be written for African climate services. However, it is clear that the kind of multi-hazard monitoring, analysis, prediction and response that African countries require still demands further investment in hard infrastructure; human resources/skill base, and business models for sustainable weather and climate information services delivery.

Public investments will always be needed for the portion of climate services that provide a ‘global public good’; however, over time, public investments can also be used for testing the feasibility of climate service products, which could eventually be developed on a commercial basis. An example might be a specific type of hourly, daily or seasonal forecast for a particular sector of agriculture, fishing or industry, which includes information about how crops, livestock or operations could be affected by the weather. These types of bespoke climate services products, once established with a solid base of users who are willing to pay, can potentially be spun off as commercial services to cross-subsidise the public need for weather and climate information, for example among households, small holders and small business owners who cannot afford to pay.²⁹

More, and increasingly refined, multi-hazard early warning systems

Multi-hazard warning systems can be highly effective in averting deaths and damage to assets and livelihoods. In the case of food-insecure regions of Africa that experience frequent climate shocks and stresses, there is a particular opportunity to link meteorological alerts more effectively with assessments of crop and livestock productivity and hence, to generate forecasts of food security impacts. "Any investment in developing or improving early warning systems should be coupled with investment in improving communication

and decision-making processes to maximise the benefit of early warning," explain Koffey et al (2014) in a submission to the UNFCCC.³⁰ "There should be stepped-up efforts to make such information accessible to a very broad range of actors, from global to community level," they continue. Dr Youba Sokona stresses that there is "an opportunity to scale up, improve with extended meteorological monitoring the Early Warning Systems that have already worked in Sahel and Horn of Africa." These need expansion across the continent, he said, with enhanced, increased observational systems – even beyond current levels of investment and effort.³¹ Disaster risk reduction is increasingly being broadened to focus on all hazards, both man-made and natural, across environmental, technological and biological hazards and risks. This is all the more important in Africa where communities face multiple stresses, including climate.³²



Urgent effort is required to enhance resilience through appropriate prevention and risk management strategies throughout African continent, including multi-hazard Early Warning Systems.

Dr Youba Sokona, Vice-Chair, IPCC



Indigenous knowledge about coping with climate variability and change

Communities are getting on with the job of adapting to climate change, deploying not only existing indigenous knowledge but – through their own innovation and ‘self help’ initiatives – trialling their own solutions. This reality must be kept in mind, and the value of this indigenous and local knowledge recognised. Whether local practices are recapturing and reviving past indigenous technologies/practices or innovating new ones, there is potential to explore how they may be further shared and adapted across relevant ecologies and social contexts in the region. For CARIAA's Pathways to Resilience in Semi-Arid Economies (PRISE) programme, approximately 2,300 producers were surveyed across six livestock and cotton value chains in Central Asia, East and West Africa. Of these, 90-98% perceived climate change accurately compared to scientific observations and projections. Most of them identified a clear impact of climate change on their production in terms of quantity or quality and the majority are taking actions that respond appropriately, such as increasing mobility, splitting herds or shifting sowing season.³³



Women farm with *zai* pits (see explanation, next page). Photo credit: ICRISAT



Teaching how to plant through the mulch. Photo credit: Dr. Kofi Boa.

Nasike Akello, an agro-ecology trainer in Kenya, observed: “If we are talking about adaptation techniques, [the community members] can tell us what they are already doing on the ground.” In the arid and semi-arid regions of Kenya where she has worked, indigenous water management techniques make the best of present conditions. “The people know that in certain months of the year, it is too hot and dry, there is no water. They live near streams, and when the streams dry, they know to dig and they are likely to find water. To prevent it from evaporating, they cover the dry river bed with tree branches to prevent evaporation... When they need water, they dig up the stream.”

Another example is the use of indigenous *zai* pit technology. *Zai* pits are in regular use in arid and semi-arid areas for retaining water. This requires digging a pit or hole of about 25-50cm in diameter and 10 cm deep in the land to be cropped, and then filling this with compost or animal manure before planting the seed (e.g. sorghum, millet).³⁴ The hole serves as a reservoir for organic matter.³⁵ “One *zai* pit can grow about six plants. If they cover it with water, it will enable them to grow more,” said Ms Akello. “These are some of the techniques the communities are putting in place to conserve what little water they have.”

This technique, which originated in Burkina Faso, has translated well to other arid and semi-arid zones of the continent, showing the potential to scale appropriate indigenous technologies. Other soil and water conservation techniques that are successfully being trialled, adapted and adopted to optimise water retention and soil fertility include: mulching, contour ridging, application of animal manure, specific planting techniques, and small-to-medium-scale water storage infrastructures such as dugouts and small reservoirs.³⁶

For instance, in shade-grown cocoa farms of Ghana, simple techniques involve the use of cut banana stalks as mulch around cocoa trees, which serves the dual purpose of retaining moisture during dry spells and harbouring pollinators. This technique is demonstrating sufficient productivity gains in plot-level trials that they have garnered the interest of larger agribusiness managers.³⁷

Indigenous and local techniques are widely used for integrated pest management. For example, the SEDLA initiative in rural Keta, Ghana used crushed neem seeds from nearby trees, mixed with water and sprayed on crops to deter insect pests and used crop rotation techniques to repel plant-parasitic worms.³⁸ These examples all demonstrate how people are calling on local knowledge and trialling and innovating with locally-appropriate materials at hand to push the boundaries of adapting to the current variability.

Scientific studies are enriching people’s understanding of how long-practiced indigenous land restoration techniques such as Farmer Managed Natural Regeneration (FMNR) can be practiced at greater scale. FMNR is a traditional practice, originating in the Sahel, by which farmers selectively prune and encourage the growth of woody vegetation from seeds, roots and stumps, to increase the retention of soil moisture and fertility, provision of food and fodder and adaptation to climate change. On the back of its widespread success in securing rural livelihoods and arresting land degradation over some three million hectares of Niger and its spread to other Sahelian drylands and further afield, deeper investigation is underway to understand which tree species and under what large ecological and management conditions it can achieve similar successful results.³⁹

Partnering intentionally with women, youth, indigenous people and other marginalised groups

Processes to identify climate vulnerabilities and risks, and decision-making and financing for adaptation solutions, must all include women's voices equally to men's. Other social groups that traditionally have less voice in decision-making must also be purposefully included – such as young people, indigenous people and ethnic and religious minorities, and people living with disabilities. Without their perspectives, action on climate change will not 'accelerate'. Solutions that are not inclusive will leave groups of people behind.

There are two principal reasons for taking intentional, gender-based approaches to climate change adaptation in order to enhance adaptation outcomes now and in the future. The first is that climate change impacts affect women and men differently. They are exposed to climate hazards differently, depending on their paid and unpaid (domestic) work roles, which are culturally and socially defined. For example, changes in crop, livestock and fisheries productivity affect women and men differently depending on their specific roles. An ESPA SPACES project in coastal Tanzania and Kenya demonstrated, through participatory assessments of the marine environment, how changes in the abundance of fish species – as a result of environmental changes – had vastly different effects on women (who harvest and process small fish for income and household use) and men (who go to sea to harvest larger species).⁴⁰



Climate change is not gender neutral. Climate change impacts affect rights-holder groups, particularly poor women, differently. Hence, climate adaptation policies and programmes should use a gender-responsive and socially-inclusive approach.

Medhin Fissaha, Gender and Safeguards Specialist, Climate-Resilient Green Economy Facility, Ministry of Finance, Government of Ethiopia



The second reason is that adaptation interventions have the potential to benefit women or accidentally disadvantage them (in a worst case, undermining their agency and leaving them worse off). Research by the Adaptation at Scale in Semi-Arid Regions (ASSAR) project cautioned that "adaptation efforts need to recognise that individuals are embedded in relations of power and hierarchies of authority, and without explicitly acknowledging these, it may be hard to progress towards equitable and sustainable outcomes."⁴¹ The same argument applies to other social groups that are typically under-represented in decision-making, such as people living with disabilities and their carers. For example, weather and climate information services, especially Early Warning Systems, must be designed in consultation with people with disabilities to ensure that they receive not only protection and support in case of extreme weather, but also distribution of humanitarian aid and evacuation from danger.



Tanzanian women catch small fish in their nets. Photo credit: Matt Kieffer.



Dukan Hussein, member of Anfa Village Savings and Loan Association, Degehabour district, Somali region, Ethiopia. Photo credit: Farn Africa/ Medhanit Gebremichael.

The gains to be achieved from gender-responsive approaches to climate resilience and adaptation are described by Arsema Andargatchew of CDKN Ethiopia, who explains, “Studies show that women-headed households in Ethiopia are more vulnerable to the impacts of climate variability, mostly due to differences in initial endowments. However, women are also important food producers and providers and have detailed knowledge of natural resources in their surroundings. An International Food Policy Research Institute project showed that when women are given access to climate information, households are more likely to better adapt themselves to climate change. Therefore, if we aim to have a more effective and sustainable response to climate change, it is critical to ensure adaptation policies and programmes take a gender approach.”^{42, 43}

A further study in Ethiopia demonstrated that it pays dividends to ensure women’s equal participation in climate resilience programmes.⁴⁴ The Market Approaches to Resilience (MAR) project extended credit and savings facilities to communities in remote rural areas of Ethiopia, providing them with the means to diversify their assets and livelihoods. This helped to buffer them from climate-related stresses and shocks.

These communities lacked basic services, and people’s survival was precarious. Each week’s food and water for people and livestock depended on unpredictable rains and a degraded natural environment. Rural women traditionally have less access to finance. Therefore, the MAR project set specific targets for women’s participation, to redress the balance. They reached out intentionally to women, some of whom also suffered the social disadvantage of widowhood.

The project found that extending microfinance services to women in these marginal communities created a powerful ‘multiplier effect’ – not only improving the wellbeing of the women themselves considerably, but also of their families.

To consolidate the project’s short-term achievements, the MAR team found it was essential to work simultaneously on strengthening the enabling environment. This ensured that project gains would be locked in, for the longer term. One of the enabling factors was financial institutions’ willingness to serve poor women and work with pastoralists. The project helped financial institutions build trust in the community members, irrespective of the potential risks related to people’s lack of permanent settlements.

A central lesson learned from Ethiopia’s MAR initiative is that intentional gender-responsive approaches work – they more than pay for themselves. Furthermore, boosting resilience at a systems level (here, by working with finance institutions to serve low-income, rural women) requires more than the typical three-year funding and investment cycle. So, donors should consider longer term, gender-responsive and socially-inclusive funding periods.

Across projects and programmes, it is important to build the capacity of programme staff in using gender-responsive and socially-inclusive tools and techniques. They do not just ‘happen’. A fundamental aspect of investing in people’s skills and knowledge for accelerating adaptation in Africa is training in these techniques. “There can be an unfortunate tendency for those in receipt of funds for climate adaptation projects to treat gender as a tick box exercise and not carry through gender-responsive assessment and design into implementation of projects,” observes Kamlesh Pillay, Climate Finance Expert for CDKN and SouthSouthNorth. “That’s why CDKN is placing an emphasis on training and peer-to-peer exchange when integrating gender into climate projects and programmes, and why we encourage donors to provide more support for training. Managers need to know how to do it well.”

Learning by doing

People are learning how to adapt to climate change by doing. Participatory decision-making tools are a practical way of building community-level capacity. Participatory Scenario Planning devised by CARE in Kenya and now used widely in several countries is one such example.⁴⁵ As described by its practitioners, Adem et al. (2020), Participatory Scenario Planning supports a multi-stakeholder, local process to:

- Access and collectively interpret seasonal climate forecasts to produce locally-relevant and trusted information
- Develop scenarios, advisories and climate-informed plans that respond to local needs in climate-dependent livelihoods and sectors
- Coordinate action among sectors to support local priorities and climate change adaptation strategies and deliver ‘user-centred climate services’
- Learn and discuss how climate services themselves need to adapt to meet information users’ dynamic needs.⁴⁶

Separate initiatives in Namibia, Botswana, Mali and Ghana as part of the Adaptation at Scale in Semi-Arid Lands (ASSAR) programme found that “Participatory processes build adaptive capacity and agency and can help transform systems.”⁴⁷ For example, in Botswana, researchers and facilitators worked with community groups through participatory Vulnerability and Risk Assessment processes to identify the effects of drought on different areas of life and livelihood. Participants then used a Transformative Scenario Planning methodology to help people who normally do not work together, to open new areas of thinking and understanding. This created a discussion space for traditionally-marginalised groups to be heard.

For instance, women were able to highlight the challenges to their livelihoods due to declines in populations of phane caterpillars, which they harvest and sell. The process also enabled stakeholders to prioritise key issues for resolution and action, such as the optimal use of land and reduction of human-wildlife conflict. It enabled “the diverse group of participants to begin collaboratively identifying solutions to these problems”.⁴⁸

The ASSAR researchers concluded that:

“Rather than state-of-the-art innovation, more often than not what is needed in adaptation efforts is good, honest collaboration among a wide group of stakeholders. These collaborations flourish when the opportunity to co-create ideas and challenge our assumptions are genuinely offered. These processes can help shift the adaptation narrative and research methods to new spaces of grounded [climate change adaptation] solutions.”⁴⁹



[As a scientist] I recognise the opportunity we have to do good science that gives good data, good information that can convince policy makers to take action.

Dr Jacqueline Uku, President, WIOMSA



Scientific literature on African climate and by Africans

Finally, data and peer-reviewed literature on climate change and its impacts on Africa is also insufficient. The number of studies, including peer-reviewed literature, of the African continent is weak due to lack of systematic, in-situ observations and modelling exercises.⁵⁰

As regards raw meteorological data, if widespread meteorological data collection is missing, then there is insufficient information to compare with climate models. This, in turn, makes it hard to generate climate projections for the region. As discussed in the section on climate services, significant further investment is needed in this meteorological observation and monitoring network and its integration into early warning systems, as well as sectoral and economy-wide planning.

Regarding levels of scientific understanding and publication on Africa's climate risks, vulnerabilities and adaptation solutions, a more extensive literature is needed, by and with African scientists, too. This is another area requiring sustainable funding support, particularly targeted at the early career researchers graduating from university programmes and seeking to establish themselves in climate science-related careers. A recent review based on surveys with some 99 early career researchers supported by the Future Climate for Africa programme found "one of the key long-term opportunities to improve Africa's climate resilience is investment in building the capacity of African researchers." Furthermore, international, multi-consortia research programmes are particularly well positioned to offer professional development opportunities: "Within inter- and intra-consortium networks, [early career researchers] can access diverse resources that are partially or wholly absent in stand-alone or individual PhD or postdoctoral grant schemes."⁵¹ Nonetheless, it is recognised that the challenges are complex and multi-faceted, involving heavy teaching loads and other institutional disincentives to academic publication.

The IPCC *Special Report on Climate Change and Land* (2019) was notable for having an increased proportion of developing country authors in total, including stronger African representation than previous reports.⁵² In a separate but complementary development, new initiatives are also seeking to build the capacity of African researchers to share scientifically robust and trustworthy climate information on Wikipedia, the world's largest source of curated, freely accessible online knowledge.⁵³

Notwithstanding these important initiatives to augment African scholars' influence in the global knowledge commons, there is still work to do to grow the overall scientific evidence base in Africa on climate change, its effects and the trade-offs and implications of various proposed climate solutions.



Women celebrate food security and related social protection activities in Malawi. Photo credit: World Food Programme, Malawi.

Invest in climate-smart economies including resilient water, energy and food systems

The first call for action (above) focuses on investing in the knowledge and skills that people need to become climate-smart decision-makers in their work, home and community lives – and information systems to support them.

Next, we turn to recommendations for accelerated adaptation in economic systems: on good practice and opportunities for change at the macroeconomic, sectoral and business level to achieve climate change adaptation and greater climate resilience.

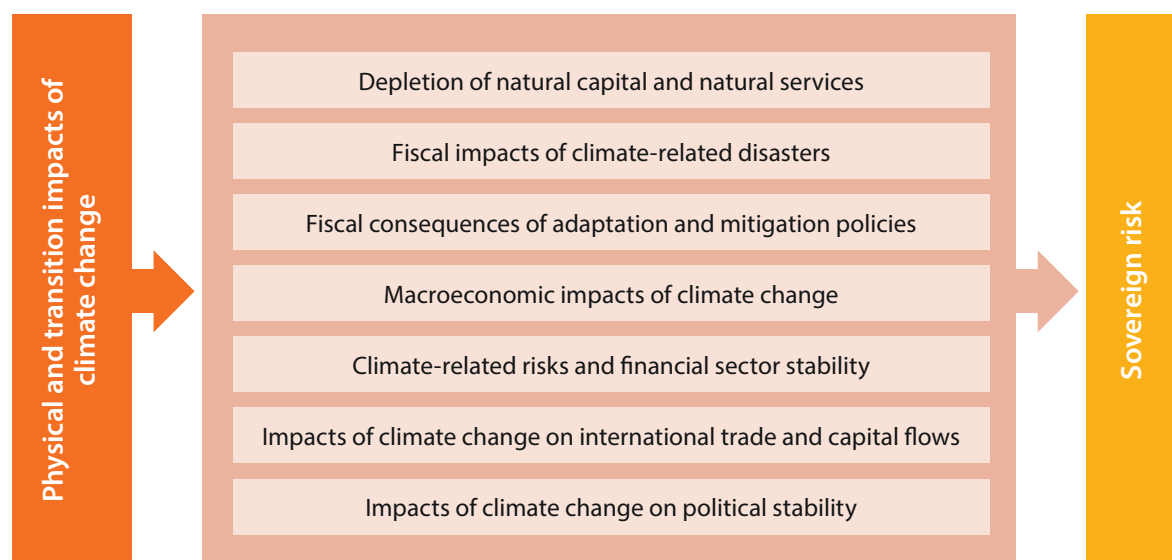
Integrating climate risks into macroeconomic and sector planning

Climate change is a source of macrofinancial instability for governments the world over (see Figure 3)⁵⁴ and particularly so in Africa, given the structural economic dependence on natural resource sectors.⁵⁵ Among the measures that governments must take in response are: a) undertaking comprehensive climate vulnerability assessments, b) mainstreaming climate risk in public financial management, and c) adjusting monetary and prudential frameworks to account for climate risk.⁵⁶

Leading initiatives in Africa are anticipating the development of key sectors and how they can adapt to expected future climate changes as well as current variability. This is happening both as integral part of and in parallel with the national processes of NDC enhancement and National Adaptation Plan (NAP) development.

Work with government planners and businesses in Rwanda's tea and coffee sectors, for example, has investigated how they can take low-regret adaptation actions. This is defined as including "options that are effective in addressing the current adaptation deficit [ie, where the benefits of investing in adaptation greatly outweigh the costs], but also future-orientated, low-cost options that build resilience, flexibility or robustness, as well as capacity building, research and information."⁵⁷ In the Rwanda case, the government's sectoral objectives were to continue to develop tea and coffee production as engines for economic growth and rural poverty reduction. However, both crops are sensitive to temperature and to rainfall variability. So, a tea and coffee resilience strategy was developed as part of the overall national, medium-term development plan, and financing was secured and early lessons from implementation documented.⁵⁸

Figure 3: Climate change has material impact on macrofinancial stability



Source: Ulrich Volz (2020) Climate change and sovereign risk. Reproduced with permission.

Applying the triple dividends of resilience

The concept of the 'triple dividends' of investing in climate resilience measures was first advanced in 2016⁵⁹ and subsequently comprised a core pillar of the Global Commission on Adaptation's flagship 2019 report *Adapt Now: A global call for leadership on climate resilience*.⁶⁰ In mid-2020, the African Adaptation Initiative and Global Centre on Adaptation set out a roadmap for the African continent's economic recovery from the Covid-19 pandemic and building of resilience to future climate change and pandemics, centred on the triple dividend principles.⁶¹

The triple dividends framework argues that climate resilience investments yield three types of dividends as follows:

- reduced losses from disasters;
- increased economic activity due to lower risks; and
- social, environmental and economic co-benefits associated with specific disaster risk reduction investments.

The framework presents a rationale for why the incremental costs of climate-proofing investments (in development programmes or infrastructure) are worthwhile; and it also provides a framework for measuring, reporting and verifying (MRV) the soundness of such investments. Until now, the intentional uptake and published MRV reports of resilience investments in the African region – using the triple dividends approach – have been limited. However, that is beginning to change.

A 2020 study of the socioeconomic benefits of investment in Tanzania's Multi-Hazard Early Warning System adopted the triple dividends framework. The Early Warning System was devised principally to alert coastal-dwellers of extreme weather events and other hazards. The study authors found that the installation and operation of the Early Warning System "led to a reduction in mortality and property damage from extreme weather events (the first resilience dividend) and an increase in household incomes (the third resilience dividend), where people engaged in fishing and related activities have been able to better plan their economic activities. Receiving early warning information does not, however, appear to have encouraged higher levels of saving and investment in these coastal communities (the second resilience dividend)."⁶² Also in 2020, the World Bank initiated a large-scale study of 100 climate resilience investments, utilising the triple dividends framework and including a significant number in Africa, with results expected to be published in 2021.⁶³

Demonstrating the financial returns and socioeconomic benefits of climate resilience investments (or, put another way, of investing in robust climate information services and their application to government and business decisions) is critical to catalysing climate-adaptive behaviour at scale.⁶⁴

Climate and environment risk disclosure and investment by African businesses

Businesses in Africa are increasingly cognisant of climate-related risks and also of the need for climate risk disclosure to shareholders. The Task Force on Climate Related Financial Disclosures (TCFD), for example, has earned in recognition and voluntary compliance in the region. The embryonic Task Force on Nature Related Financial Disclosures (TNFD) is also gaining traction.⁶⁵

While we note the consistent recognition by Africa's public sector and civil society of the value of 'green' public works programmes – which contribute to climate change adaptation, regeneration of natural ecosystems and biodiversity protection (see page 27) – it is also the case that Africa's private and public sectors are increasingly deciding to invest in adaptation and climate-related disaster risk reduction on the basis of commercial considerations. Based on recent South African experience, "Adaptation pays for itself",⁶⁶ argues Alex McNamara, the Water Lead at the National Business Initiative (NBI) in South Africa. Examples include recent investments in eThekweni municipality, to clear rivers and stormwater systems so that intense rainfall will not overwhelm the man-made infrastructure. Another South African example involves the clearance of invasive and water-hungry plant species, and using the wood for high-value handcrafted furniture and other marketable goods. These adaptation measures restore wetlands and water availability in semi-arid zones, as well as create jobs.⁶⁷



Tea picker, picking tea along Kenya's Tana River watershed. Photo credit: Georgina Smith, CIAT.

Studies at city-scale, such as an Adelphi study of small business responses to flood events in Kigali, Rwanda,⁶⁸ find that a majority of small businesses are taking precautionary action and learning from each other to deal with extreme events. However, at a systems level, the potential of micro-, small- and medium-sized enterprises to adopt climate risk assessment and management and be at the forefront of local responses to climate change and climate resilient development is ad hoc rather than coordinated, and hence under-exploited. This is an area that merits rapid expansion of effort.

A rise of 'blended finance' approaches to climate project financing, involving both public and private financiers, is on the rise in the region. This has been well documented in the SADC region by the Southern African Climate Finance Partnership.⁶⁹ Blended finance combines different finance instruments, such as concessional loans and equity investments to name but two, which allow the public sector to de-risk climate resilience investment, particularly at scale, and so crowd in private investors.

A general approach for blending finance, says Ronald Mukanya, Director for Sustainability in the government of the Western Cape, South Africa, would be a 10:80:10 rule, whereby for every dollar or its equivalent "the public sector brings the 10 cents they have, the private sector brings the 80 cents, and the international partners perhaps bring the other 10 cents that we need to solve a certain problem."⁷⁰

"There also needs to be some innovation about how that hybridising or blending of finance needs to be done. It can't be a one size fits all; it's got to figure in the context of the respective economies and...[be] relevant to the context at hand."

Access to adaptation finance at all levels of governance

Sources of adaptation finance

The majority of public climate finance worldwide – to the extent that we can track it – originates from the countries themselves. It comes via national development finance institutions, where a single country owns the institution and finance is directed domestically.⁷¹ Multilateral and bilateral development finance institutions provide most of the rest of public climate finance.

Furthermore, the annual *Landscape of Climate Finance* report⁷² reveals that finance for climate change adaptation comes principally from the public, not the private sector (with the caveat that "adaptation finance tracking, regardless of funding source, is constrained by definitional challenges making it difficult to

distinguish climate-related finance from regular business operations and broader development finance, as well as conceptual and accounting issues, confidentiality restrictions, and a lack of universally-accepted impact metrics⁷³). Notwithstanding, African governments are clear in their initial and enhanced NDC submissions (2015, 2020) that they can be far more ambitious in implementing adaptation action if their own resources are supplemented with external support. Available adaptation finance is ‘significantly lower’ than the needs expressed in the NDCs, which have been estimated at over US\$50 billion per year for 50 non-Annex I countries for the period 2020 to 2030 – according to the UN Environment Programme – and even these are considered under-estimates.⁷⁴

The challenges for African countries and organisations to access international public finance for climate change adaptation are well documented. They include the long time and onerous process required for institutions to be accredited by international climate funds; followed by similarly time-consuming and expensive processes to access project finance. Moreover, Least Developed Countries in Africa, which have few climate change mitigation projects in the pipeline and yet suffer urgent climate change adaptation needs, face the same towering challenge as all LDCs when it comes to climate finance: namely, the majority of international public climate finance targets middle-income countries.^{75,76}

International climate funds are gradually shifting their practices by providing readiness support for developing countries that wish to access project finance (including the Adaptation Fund, for Least Developed Countries specifically, and the Green Climate Fund, more generally). This involves funding and technical support to strengthen the capacities of host country institutions in the accreditation process, and to meet the project preparation requirements.

Decentralising climate finance

There are widespread calls among African civil society institutions, NGOs and subnational governments for climate finance to be decentralised to a much greater extent. Studies estimate that less than 10 percent of climate finance (worldwide) reaches local actors.⁷⁷ “Access to green funds is a preoccupation of our subnational governments,” remarked Augustin Ouedraogo, Centre Nord Regional Council, Burkina Faso.⁷⁸ He noted that political decentralisation processes have not necessarily been accompanied by the decentralisation of financial resources. “The disruption to external aid because of Covid-19 has made the situation even more difficult,” he added.



The Red Cross in Uganda has piloted forecast-based financing, whereby humanitarian relief supplies and equipment are rapidly distributed in communities to reduce the effects of an extreme weather event (here, heavy rain and floods), when such an event is predicted. Photo credit: Ugandan Red Cross Society.

However, the access to and allocation of climate finance remains a hotly contested arena. It is recognised as highly political, as access to resources always are. The politics of climate finance flows between national and subnational actors become even more complex when different political parties and/or different ethnic and religious groups control government at the different tiers of administration. As a principle for navigating the complex politics, some have emphasised the need for vertical integration of different levels of governance matched by finance allocations and revenue raising powers at respective levels.⁷⁹ A good place to start is to clarify the mandates for climate action at subnational and city levels. From clearer roles and responsibilities will flow more coordinated action and potential for effective disbursement of funds.

A Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED) study in 2019 of the initial achievements of nationally-owned and sub-nationally implemented (decentralised) climate adaptation funds in Kenya, Mali, Senegal and Ethiopia concluded that: "The effective delivery of climate finance to local communities depends on the national administrative structures through which decentralisation is delivered. The decentralised climate finance approach should, therefore, not be characterised as working solely at the sub-national level, as its success is critically dependent on the national administrative architecture that supports decentralisation."⁸¹



We have been having discussions with the [multinational development finance institutions] who say they need multi-million dollar solutions to be attractive to large funders, but a lot of our communities have been looking for smaller solutions, especially in secondary cities. We need small solutions that are hyperlocal.

Dr Meggan Squires, Senior Manager, Climate Change, Energy and Resilience, ICLEI Africa⁸⁰



Meanwhile, women and young people, who are also marginalised constituencies in civil society when it comes to receipt of climate finance, are mobilising massive in-kind efforts to tackle climate change. They are demanding greater recognition in decision-making and access to funds, both in the context of Covid-19 recovery and more broadly.

Varied toolkit of finance instruments required

There is widespread eagerness to deploy finance instruments to avoid and minimise climate-related loss and damage (including via forecast-based early action on short time scales), as well as to compensate communities and businesses for unavoidable loss and damage after the fact.

When it comes to finance, the achievements of Africa Risk Capacity (sovereign insurance) and initiatives to expand insurance to climate-vulnerable households and businesses are widely recognised and saluted. Examples include mechanisms such as risk pooling using parametric insurance that allows for pre-specified payouts based on a trigger event. There is also an appetite to expand the testing and wider application of institutional arrangements and climate finance mechanisms to further reduce climate-related loss and damage, on the basis of forecasts of extreme weather. This is a call to expand the entire financing toolkit and related flows.

The launch of the Risk-informed Early Action Partnership (REAP) at the UN Climate Summit in September 2019 was particularly timely for African countries. It constitutes a global partnership of governments and humanitarian and climate experts to help protect one billion people from disaster. The high profile of, and initial donor funding for, the REAP has instilled further momentum into the growing movement for 'anticipatory humanitarian action' in response to forecasts of extreme weather events and climate extremes – both in Africa and among developing countries more generally. In this context, forecast-based financing is expanding, defined as "enabling access to humanitarian funding for each action based on in-depth forecast information and risk analysis. The goal of forecast-based finance is to anticipate disasters, prevent their impact, if possible, and reduce human suffering and losses".⁸² The approach has been trialled by the Kenyan Red Cross with important lessons and subsequent opportunities for refinement.⁸³ Anticipatory humanitarian action has become a "non-negotiable approach", noted Dunja Dujanovic from the Food and Agriculture Organization at the Africa Dialogue Platform of the 8th Global Dialogue Platform on Anticipatory Humanitarian Action (2020).⁸⁴

Increasing capacity for climate-resilient water management

The fragility of water access in a changing climate is well recognised across Africa. Some, not all, sub-regions of Africa are projected to see overall declines in rainfall in the 21st century (page 3), but nonetheless, the continent as a whole will face less predictable rainfall. Furthermore, given population growth and demographic movement (including but not limited to rural-urban migration), river basins covering a significant proportion of sub-Saharan Africa will be classified as 'high risk' of water scarcity by mid-century.⁸⁵ Across Africa "a growing number of countries and cities are including water-related adaptation into their planning, policy, and institutional response to such predicted impacts as rising sea levels, more frequent droughts, and increased precipitation," according to Alex Simalabwi, Climate Resilience Lead for the Global Water Partnership (GWP) and Director of GWP, Southern Africa. However, there are still major gaps in implementation of these plans and finance for doing so, according to Simalabwi. Focusing on bridging the action and finance gaps must be a priority in the critical decade ahead. African scientists and development practitioners are pursuing a range of research directions and management strategies to do so.

First, there is a substantial effort underway to strengthen knowledge and applied skills for climate-resilient water infrastructure planning and management capacity. The Water, Climate and Development Programme (WACDEP) for Africa (2011-2019) was a major programme, backed by the African Union, to integrate water security and climate resilience in development planning processes. It is now succeeded by an Africa Water Investment Programme (AIP) (launched March 2020) with the goal of "transforming and improving the investment outlook for water security and sustainable sanitation for a prosperous, peaceful, and equitable Africa".⁸⁶ A project preparation facility run by GWP complements the climate finance readiness support from international climate funds, to support African governments and organisations to access finance for climate-resilient water projects. Meanwhile, an African water investment scorecard will be launched in 2021 by GWP and partners from the African Union Development Agency, African Ministers' Council on Water, African Development Bank and Development Bank of Southern Africa. The scorecard is targeted at measuring, informing and catalysing political leadership to "accelerate water investments and narrow the water investment gap on the continent".⁸⁷

Work by Abuya et al. (2019) in Kenya underlines the argument that a failure to adequately measure and monitor freshwater use is a stumbling block to adequate climate change adaptation in the water sector. In their water supply-chain analysis, they find that there is a need to address the risks along the entire water value chain: from 'upstream' watershed management through investment in diversified sources, such as boreholes and rainwater harvesting, through climate-proofed piping and storage improvements and flood mapping for siltation control (along with solar water pumping to reduce diesel costs – a key contribution on the climate mitigation side).⁸⁸

Second, recognising the range of future scenarios for rainfall at local or catchment area, efforts are underway to narrow the uncertainty. This is because "despite our improved understanding of global climate change drivers, teleconnections and processes, regional impacts remain uncertain as demonstrated by the often large spread between climate model projections of precipitation."⁸⁹ Through partnerships between scientists, affected communities and policy-makers, it is possible to identify water management options that weight the most robust climate projections and are suited to the greatest number of plausible future climate scenarios and, therefore, afford the highest likelihood of future suitability. This approach to 'mapping the robustness of alternatives' to support multi-criteria decision-making has been applied to Tanzania's Rufiji river basin. In this basin, decision-makers face challenging trade-offs between rapid expansion of upstream irrigation, large hydropower development and downstream ecosystem requirements, all in a context of uncertainty around future rainfall.⁹⁰

Assessing climate risks in energy development

Emergent thinking by African organisations stresses the need for energy choices to be climate-resilient and climate-adaptive. There is still considerable, untapped potential to integrate climate change adaptation and resilience, as well as mitigation objectives, in Africa's energy sector. Vast opportunity remains for energy planners and financiers to apply climate risk assessment and management tools to their energy investments, following in the steps of early pioneers.

It is widely recognised that Africa's energy needs are pressing, and there is a large gap in access to affordable, reliable clean energy services in the region (Sustainable Goal 7 and *Africa Agenda 2063*).



A customer in Nairobi tops-up on clean fuel at a KOKO Fuel ATM. Photo credit: Koko Energy.

There are 510 million people in sub-Saharan Africa who are projected to lack access to electricity in 2021; 818 million are projected to lack access to clean cooking in 2021.⁹¹

Countries' energy sector plans and project finance, insofar as they are climate-compatible, place a priority on climate change mitigation. The potential of renewable energy technology to fill Africa's energy gap is supported by local, national and region-wide initiatives.^{92, 93}

Because in Africa, climate mitigation projects are inevitably driven by overall development needs, such shifts to clean energy tend to have strong benefits for climate adaptation and resilience, too – even if accidentally so. Clean cooking initiatives provide an example of how shifts to clean energy, driven by mitigation and development imperatives, can have good climate adaptation benefits as well. Many African countries are looking to replace unsustainable charcoal production for home cooking with sustainable clean cooking technologies, ranging from liquid petroleum gas (LPG) to sustainably sourced bioethanol to pure solar technologies.⁹⁴

By reducing human drudgery in charcoal production, and lowering indoor air pollution at the point of consumption, implementation of these policies improves human health and wellbeing. Reducing deforestation also creates local environmental benefits as well as regional and global climate benefits.



Energy is a barometer of our social and economic development. Without energy you cannot do virtually anything. I would say we in Africa do not have an emissions problem, we have a growth problem. We can use energy as a corridor to enable that growth.

Dr Fatima Denton, United Nations University



However, there is a strong case for more widespread and intentional use of climate risk assessment methods in the energy sector. Pioneering initiatives include the 'eco-development' methodology trialled in Benin, Mali and Togo's energy sectors.⁹⁵ The multi-dimensional tool helps policy-makers and other stakeholders to rate energy development options on many criteria, including the vulnerability of renewable energy systems to climate change. For example, one can ask: Are a country's energy development plans overly reliant on large hydropower schemes whose operational capacity is affected by annual or seasonal reductions in rainfall? Is power generation centralised in such a way that transmission systems are highly vulnerable to failure during extreme heat and storms? To what degree can such climate risks be alleviated through the provision of better, more timely weather and climate information and improvements to operational procedures? Or, should alternative clean and renewable energy options be considered with fewer climate risks? Scaling up the use of multi-criteria risk analysis tools such as these will help African countries find clean energy solutions that support climate resilience and are not maladaptive.

Climate change as one of many compounding stresses on food systems

In 2020, the convergence of Covid-19, climate variability and change (as manifested in extreme events, such as extreme flooding in Sudan) and other threats, such as desert locust plague in East Africa, make abundantly clear the compounding character of stresses and vulnerabilities.

Tools and skills are needed for multi-hazards and compound crisis management. African governments know they need strengthened decision-making support and management tools in the face of multiple and rapidly evolving emergencies. There are champions in governments willing to try new ways, to learn fast. Although tools for multi-hazard risk assessment and management are still in their infancy, it is evident from early experiences in developing weather and climate information services (Box 3, below) that iterative approaches among scientists and the users of the risk information about specific cases will be essential for the rapid and effective development, field testing and refinement of such tools.

Box 3: Improved climate change adaptation in the grains sector

Collaborative work between scientists and farmers demonstrates the power of partnership in co-producing effective adaptation responses.

The Eastern Africa Grain Council (EAGC), in partnership with CDKN, launched the Climate Information for Grains (Ci4G) tool in October 2020, an online platform that is designed to help farmers and others in the grain sector to plan short-term activities and build resilience to variable weather in the medium term.

The Ci4G tool provides weather forecasts and makes actionable recommendations based on the forecasts. These include, for example: when to start planting, harvesting, or performing post-harvest activities, such as drying. Recommendations are tailored to each farmer based on their location, the grain that they are growing, and the stage of the cropping cycle.

The team was challenged by farmers' lack of internet access in Kenya and Uganda, especially among small-scale farmers, whom the Ci4G is designed to help. To address this, the EAGC developed an SMS-based system alongside the online platform. This will share recommendations with the Grain Hubs (field-based centres) based on the weekly weather forecast specific to the location of the hubs, which will enable their members to make timely decisions based on their situation.

EAGC is working to support the farmers further by linking the advisories to suggestions of climate-smart technology suppliers, where relevant. This feature should improve the likelihood of farmers' taking up the recommendations. It will guide farmers toward improving their longer-term resilience to variable weather and climate by using technologies such as drought-resilient seeds or hermetic storage bags to better preserve their grains after harvesting.



[Uptake of] the tool will, without doubt, contribute to food security in the region and help to end drought-related emergencies.

John Mwangi, Drought Information Manager, Kenyan National Drought Management Authority (NDMA)



Market trader in Malindi, Kenya. Photo credit: Mauro Eugenio Atzei.

Invest in nature

The awareness of biodiversity and appreciation of healthy, vibrant ecosystems that sustain productive capacities and enrich culture, heritage and quality of life are being flagged as a priority by a wide range of community organisations, NGOs, and development practitioners and business leaders, as well as scientists across Africa. Given Africa's context of population growth, urbanisation and rapid land use change, the conservation of nature is critical, they say. Protecting nature is critical for people's resilience, for societal resilience, including achieving the targets of the NDCs and NAPs, and for the sustainability of business.

Although the climate, biodiversity and ecosystems may have a tendency to be addressed via different silos in international policy frameworks, they are experienced and addressed in a wholly integrated way by communities. This is particularly the case for the burgeoning youth environmental movement. Young people are not seeing climate and nature as apart. Diverse youth-led initiatives for the restoration of the natural environment are springing up across the African continent.



One thing Africa needs to adapt to climate change is nature. This may seem obvious, but it deserves emphasis. Functioning natural systems underpin climate adaptation. Why? Because functioning ecosystems, rivers and landscapes are Africa's drought, flood and fire prevention. When it comes to climate change, nature is disaster risk reduction. Certainly, where I come from, South Africa, this context is increasingly understood.

Alex McNamara, Water Lead, National Business Initiative (NBI), South Africa



I am passionate about ecological farming because basically, it is about our health, it is about our environment, nature sustains us. Everything in the environment sustains us. So the minute we ruin nature, we are ruining ourselves... In 2030, I would like to see that we have more green spaces, that we have people interacting with nature whether they are in the urban area or the rural area.

Nasike Akello, Kenyan environmental educator and campaigner



Nature-based solutions to climate change receive new impetus

In 2020, the International Union for Conservation of Nature (IUCN) issued its *Global Standard on Nature-Based Solutions*, which is a game-changer for Africa and other regions worldwide because it will drive policies and investments that are good for climate resilience and mitigation and also good for nature.⁹⁶ The *Global Standard* asserts that enhancements in *both* human wellbeing and in biodiversity are a part of 'true nature-based solutions'.

Both are needed because "increased demand for nature-based solutions has led to cases of misuse of the concept, and even good intentions can result in harm to nature and people. In the worst-case scenarios, misuse runs the risk of damaging biodiversity and eroding the nature that we depend upon for services, such as clean water and food." An example of a potentially harmful or maladaptive intervention, mis-named a 'nature-based solution', may be a tree plantation that sequesters carbon but is planted with a single species of tree – thus undermining biodiversity – and the management of which excludes local people who previously had use rights to a forested area – thus undermining local people's development prospects.

An example of a beneficial nature-based solution could be replanting degraded forest land with a mix of native species and providing access and use rights to local people for a range of cultural, spiritual and recreational uses as well as sustainable income-generating activities (eg non timber forest product harvesting at regulated/sustainable levels) and also generating global and regional public goods from the greenhouse gas sequestration and land-climate interaction. From a climate change adaptation perspective, the promise of the IUCN guidelines and their intentional application in Africa – in name or in spirit – is that the focus on both human wellbeing and biodiversity enhances the adaptation potential of climate mitigation projects, and reduces the likelihood of maladaptation.

Examples of both good and poor practice in afforestation in Africa are documented in the IPCC's *Special Report on Climate Change and Land*.⁹⁷ The *Special Report* includes examples where afforestation for carbon sequestration have been undertaken at the expense of biodiversity and local people – and so have been maladaptive. It also includes instances where integrated and holistic approaches have been taken (in the spirit of the IUCN guidelines, which were published subsequently) – and so have been beneficial. Here, we focus on lessons from good practices, which have the potential for scaling up.

In Malawi, initiatives to restore watersheds through forest replanting have been underway for some years and are taking a community-based, holistic approach. “The consequences of many years of deforestation have become increasingly evident in Malawi,” writes Sosten Chiota.⁹⁸ Forest cover declined by more than half – from over 4 million hectares in 1972 to just under 2 million hectares in 1992 – and continues to decline at a rapid rate, he notes. “The consequences of this deforestation are widespread, including a lack of nature-based regulation of water supplies, because forests are a natural regulator of water flows. This has consequences for irrigation and fisheries – which are important around Lake Malawi and Lake Chilwa. Perhaps most importantly, the bare ground created by deforestation leads to flooding, increasing disaster risk.”⁹⁹

An integrated watershed approach was applied in Lake Chilwa from 2010-17, inspired by local residents who expressed concern about the drying of the lake. Through an exhaustive consultation process, communities and other stakeholders defined the key issues: the main ecosystem areas; their structures and functions, including economic benefits; and the interaction between the different ecosystem components. They set long-term goals and mapped a series of restoration activities, including forest regeneration and even banning of infrastructural developments and farming in the most degraded parts, to achieve these goals. The intensity of the consultation and coordination process led to Chiota's conclusion that “we have good reason to believe that nature-based solutions are effective in enabling adaptation – but they are certainly not easy” in institutional and governance terms.¹⁰⁰

Critically, identifying and pursuing nature-based solutions to climate change adaptation, mitigation, biodiversity conservation and local development and wellbeing calls for actors to work across governance jurisdictions, as well as socioeconomic and sectoral boundaries. A promising example of how local actors are mobilising across jurisdictions to explore nature-based solutions is in the Greater Accra region of Ghana.



Ethiopia – community based rainfed watershed management. Photo credit: ICARDA - Science for Resilient Livelihoods in Dry via Flickr

Here, five local assemblies participated in a peer-to-peer learning event on flood management as part of the seventh Climate Change and Population (CCPOP 7) meeting.¹⁰¹ They collectively assessed how nature-based flood control methods, such as enhanced wetland conservation and restoration ('green infrastructure'), could be combined with hard infrastructure approaches ('grey infrastructure'), such as improved maintenance of culverts. Together, such combined green-grey approaches were shown to improve water flows, water retention and infiltration in natural areas that enhance biodiversity, while reducing harmful impacts on urban settlements, services and economic activities.¹⁰²

Finally, a mangrove restoration initiative in Gazi Bay, Kenya, called 'Mikoko Pamoja' ('Mangroves Together') is an example of a locally-appropriate, truly nature-based solution to climate change, which fits the IUCN criteria. The Mikoko Pamoja initiative engaged communities to restore thousands of new trees along the coastline. Because the mangroves are a foundation species in the ecosystem (they have a role in providing the ecosystem's structure), they enhance the habitat for many other species, including playing a key role in fish spawning.¹⁰³

The mangrove restoration work also enabled the Gazi Bay community to apply for accreditation to sell carbon credits through the voluntary carbon market. This has, in turn, generated a steady stream of income and an incentive for committed mangrove conservation. The sale of carbon credits is now funding new conservation and community projects, including education.¹⁰⁴ These sustainable development benefits are, themselves, a contribution to the community's resilience in the face of future climate shocks and stresses. Furthermore, mangroves have a documented role in reducing wave energy and moderating the effects of storm surges on coastlines; so the mangrove forests may reduce disaster risks in the area, too.

The Gazi Bay approach to nature-based solutions demonstrates what could be termed 'triple wins' for climate change adaptation, mitigation and local development; or, it could also be termed 'mitigation-based adaptation'. In this case, the mitigation component – the carbon credit sale – is the driver of sustainable revenue. It provides an example of good practice, and the original pilot project area has already expanded. Its approach is now being adapted and applied in other parts of coastal Kenya.¹⁰⁵



Mangrove training course with James Kairo in Gazi, Kenya. Photo credit: Romy Chevalie.

Public works programmes for green jobs

Many African governments recognise, and are investing in, the potential of public works programmes to generate green jobs. This is especially so for watershed rehabilitation/ ecosystem restoration works. These range from the very long-established South African Working for Water programme to rehabilitate watershed health and encourage the protection of native vegetation through removal of invasive plant species,¹⁰⁶ to government-approved tree-planting initiatives to restore watershed health in Malawi,¹⁰⁷ to Kenya's youth-led Green Generation Initiative,¹⁰⁸ to the aforementioned Great Green Wall Initiative (GGWI) and many in between. The GGWI is an astonishingly ambitious, 21-nation effort, stretching across the Sahel to the Horn of Africa, from Senegal in the west to Djibouti in the east. The initiative aims to halt and reverse land degradation and establish a 'mosaic' of restored and productive ecosystems which, most importantly, support local communities and their livelihoods.¹⁰⁹



In South Africa we are using our public works programmes to employ the unskilled...and it grows our green economy.

Ronald Mukanya, Director for Sustainability, Government of the Western Cape, South Africa



Emerging experience, for example in Malawi, is pinpointing the importance of tracking green public works participants through the programme and providing them with access to and support of social protection systems and graduation pathways into sustainable jobs (if the public work opportunities are short-term). This is so that they may stay out of poverty, and their families and broader communities may enjoy the ripple effects of the additional income.



The Great Green Wall... provides opportunities, not just for reforestation in those zones from Senegal to Djibouti but also enables the creation of integrated development areas.

Emmanuel Seck, ENDA Energie



The Building Resilience and Adapting to Climate Change in Malawi (BRACC) programme is looking at how to increase the harmonisation and cohesion of support to those engaged in green jobs schemes and also shock-sensitive social protection systems – to better lock in progress and prevent households from slipping back into poverty.¹¹⁰

Debt-for-nature swaps, blue and green bonds

Several of the newer, more emergent financial instruments now supporting adaptation action in Africa are tied to investments in natural infrastructure. These include blue and green bonds, and debt-for-nature swaps.

Green bonds are bond instruments of any type that generate revenue (and pay dividends to investors) from investments in activities that are 'climate aligned' and otherwise of environmental value. The green bond market in Africa is nascent – with a value of over US\$2 billion as of October 2019 – but is thought to have "huge potential to mobilise private and to some extent public sector capital" to finance low-carbon transition projects and other initiatives, including adaptation.¹¹¹

Of the 17 bonds so far issued in six countries across the continent, 6% are for climate-resilient water infrastructure and 9% in the 'other' category, including adaptation (most have been for energy efficiency and renewable energy purposes and/or for afforestation; all of which are climate mitigation-led but in many cases also have adaptation co-benefits).¹¹²

They include Nigeria's sovereign green bond and issuances by subnational/municipal authorities and private companies. The proceeds from Cape Town's municipal green bond, which was four times oversubscribed, are going towards a mix of climate change mitigation and adaptation investments, including clean transport (electric buses), energy-efficient buildings (green buildings), sewage effluent treatment, alternative water management and coastal protection structures in the city.¹¹³ A blue bond is a debt instrument issued by governments, development banks or others to raise capital to finance marine and ocean-based projects that have positive environmental, economic and climate benefits. The Seychelles was the first African country to secure a blue bond with the backing of the World Bank in 2018 when it "used an approach akin to the green bond financing framework to secure the deal involving a guarantee by the World Bank... The proceeds from the bond issue will pay for marine protection, fisheries management and other projects to protect the ocean economy on which the Seychelles depends."¹¹⁴

Also pioneering on the continent was the Seychelles debt-for-nature swap (and again, like the blue bond, channelled through SeyCCAT^{115, 116}); described as “a debt forgiveness in which a portion of a developing country’s foreign debt is forgiven in exchange for a commitment for investments in domestic environmental conservation and sustainability projects.” Although this type of instrument has piqued the interest of numerous actors in the region as offering ‘wins’ for nature, communities, and governments; like other forms of large-scale public climate financing, the Seychelles pilot involved relatively high transaction costs. The onus in the coming years will be on continued learning from this experiment and refinement of the model to deliver multiple benefits with contained transaction costs.

Concluding remarks

What does successful adaptation ‘at scale’ mean for Africa?

When we talk about ‘bringing adaptation to scale’ in Africa, we need to be careful with our meaning of ‘scale’. This does not mean straightforward replication of adaptation solutions from one locality to another – in granular detail. Successful principles are shown to be effective if adopted and applied in Africa’s extraordinarily diverse geo-physical, ecological, social and cultural settings. These include, for example, the principle of identifying appropriate indigenous knowledge for responding to localised climate variability and supporting its local diffusion; and the principle of integrating local wisdom for coping with today’s climate with scientific projections of future climate change so that decisions with long horizons are well informed.



Africa is the place to be, as we have a lot of climate solutions, if we take time to look at the grassroots and find out how people are coping.

Dr Jacqueline Uku, President, WIOMSA



Technologies that support climate change adaptation and the avoidance of unnecessary and harmful emissions, such as clean cookstove technologies for instance, have the potential to be replicated on a far wider scale. However, the marketing and uptake strategies, the regulatory requirements, the policy frameworks and institutional arrangements for scaling are different among countries, even sometimes among sub-national regions or localities.

Financial instruments, such as green or blue bonds (to take just one example), have massive potential for roll-out at greater scale, but need to be designed carefully to underwrite the adaptation actions that are best suited to national or local circumstances, along with the commitment of diverse implementing stakeholders.

If African countries adapt successfully to climate change at scale, there will be an even greater profusion of appropriate, locally-owned and locally-appropriate initiatives that maximise effective coping strategies for current climate variability. There will also be greater adoption of measures to enable the maintenance of the growing populations’ food, water and energy security needs this century, and their economic and social development.



If there are no funds to deal with the drought, if there are no funds to help communities that are languishing in floods, then the probability of the communities adapting to this is very low. So we have to ensure that we as Africans push our leaders to prioritise climatic variations, to ask... how is this affecting our communities. If we have the political goodwill, if we have the good policies that allow us to adapt to climate change, then we as a people are resilient enough to deal with this.

Nasike Akello, Hummingbird Foundation



Who needs to change, in order to accelerate action? Some changes in the capacities of local actors and institutions are necessary, for sure. Indeed, this paper has reflected the intense appetite for new knowledge and skills enhancement by all the contributing interviewees and guest bloggers who are working at community level. Many of the changes to ‘business as usual’ – including structurally and operationally – will need to come from the actors in government and international development partners who have the resources to support these local initiatives, by disbursing more resources to local levels where they are needed, for

example. This must happen, say climate adaptation experts, in an enabling environment of strengthened governance, including greater transparency and accountability to Africa's people.

Three key areas for investment

In summary, the three headline messages from African adaptation scientists and practitioners, for decision-makers, on how to accelerate adaptation action in Africa are:

- Invest in people's skills and knowledge.
- Invest in climate-resilient economies, which are well-informed by climate risk.
- Invest in nature.

The three areas are, of course, inextricably linked. The experts highlight that Africa's people and natural resources are the continent's greatest assets – they provide the very foundations of sustainable, climate-resilient economies.

Climate Adaptation Summit, COP26 and beyond

The Africa anchoring event of the Climate Adaptation Summit (25-26 January 2021) provides an important opportunity for African climate leaders from all parts of society to elaborate these themes and for international development partners to respond. The event can lay the groundwork for even more mutually supportive, African-led and locally-informed adaptation activities to develop, on the road to the landmark COP26 conference in November 2021, and well beyond.



Farmer dialogue with local government, Uganda. Photo credit: G Walker.

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